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Effect of different types of 8-HQC-based pulsing solutions on the post-harvest life of *Heliconia* flowers

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ABSTRACT

Now a days Heliconia is an important cut flower for garden decoration, value added product preparation and organic colour extraction purpose. It is also called lobster-claw, false bird-of-paradise or wild plantain and it belongs to family Heliconiaceae, has 250 to 300 species. Various types of chemical have been applied in four species of Heliconia such as; Heliconia rostrata, Heliconia psittacorum cv. 'Golden Torch', Heliconia psittacorum var. 'Choconiana', Heliconia humilis. This research was conducted with three replications and ten different treatments. Five most important parameters were studied here such as; total water uptake, change in fresh weight of flowers (4^{th}, 8^{th}, 12^{th} days after application of chemical), flower opening in bracts, catalase activity (7^{th}, 9^{th}, 11^{th} days after application of chemical) and vase-life of flowers. Highest water uptake capacity, Flower bract opening, Vase life of flower was taken from T_3, T_9, T_5 and T_6 in H. humilis. Highest water uptake capacity, flower bract opening, vase life of flower was taken from T_4, T_6, T_6 in H. psittacorum cv.'Golden Torch'. Highest water uptake capacity, flower bract opening, vase life of flower was taken from T_7, T_7, T_5 in H. psittacorum var cv.'Choconiana'. Highest water uptake capacity, flower bract opening, vase life of flower was taken from T_3, T_7, T_7 in H. rostata.

Keywords: *Heliconia*, post-harvest, pulsing solutions

Now a days *Heliconia* flowers are most popular for garden decoration and it is also used for colour extraction (Gusmo *et al.,*2018). The value of this flower is increasing in our society day by day and it has several names such as false bird-of-paradise, lobster-claw, and wild plantain. *Heliconia* flowers has multiple coloured bract and beautiful structure of flowers, originated from South and Central America. It has been used for ornamental plant and cut flower purposes because *Heliconia* has attractive colors and an exotic appearance. Their enhancing beauty has made them a best landscape and as a potential cut flower. *Heliconia* appears in wide range of colours such as red, pink, orange, yellow, and green combined with different sizes and shapes. Due to its exotic appearance and attractive colours, it fetches premium price in the market. Some species of *Heliconia* leaves are used for cut leaves in flower decoration. The genus of *Heliconia* (Heliconiaceae) has several species and such species has potential for cut flowers production. The genus *Heliconia* has 250-300 species found primarily in near tropical areas from the North of Mexico to the South of Brazil (Santos, 1978; Dahlgren *et al.,* 1985; Kress, 1990a). Tropical parts of the world are the native places for multiple species of *Heliconia* conceivably long or dwarf due to their horticultural and commercial vogue and exploitation as ornamental plants both in landscaping, vase decoration purpose (Pinheiro *et al.,* 2010) and to adorn homes, administrative and public places, apartments *etc*. (Kress, 1990b) owing to diversity in hues and longer durability of its floral bracts. Various allured shapes and impressive hues make cut *Heliconia* flowers quite captivating (Andersson, 1985). Vital attributes of *Heliconia* cut flowers are the imperturbability and posture may be upright or pendulous of inflorescences as it enhances handling, packaging and imperishability during transportation and empowered elongated vase life (Costa *et al.,* 2011). In India, Kerala, Tamil Nadu and West-Bengal has the prospective for congenial climatic condition to endow *Heliconia* to the global flower market although perpetual flowering cycles the additional cardinal rationale of few varieties to clinch their vogue.

There are vital mantle of various chemicals like germicides and sugars as vase solution on post-harvest flower quality and longevity of different cut flowers. Post-harvest chemical treatments are employed to minimize known post-harvest complications and extend flowers case-life. Vase solution containing sugars impressively retarded petal wilting, abscission and lengthened flower longevity since exogenous sugar pledged substrates for respiration, structural support and improve water balance in cut flowers (Pun and Ichimura, 2003). 8-Hydroxyquinoline citrate (8-HQC) customarily treated as antimicrobial agent in vase solutions since translocation of solutes by xylem vessel are obstructed by existence of bacteria in vase water eventually impaired the lastingness of cut flowers (Healy and Lang

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1989; Lukaszewska *et al.,* 2008). Silver nitrate ($AgNO_3$) enacted indispensable role to diminish few predominant post-harvest problems analogous with cut flowers by interfering the binding sites of ethylene, is habitual forms of silver salt in flower preservative solutions (Singh and Tiwari 2002; Darras *et al.,* 2010; Elgimabi, 2011). Existence of Ca^{2+} ions in cell membrane and cell-wall bestowed cell-wall rigidity, an intrinsic part of cell-wall.

MATERIALS AND METHODS

The experiment was carried at the laboratory of the Department of Horticulture, Institute of Agricultural Science, University of Calcutta. The climate of this region is typically tropical, characterized by hot and humid summer, warm and humid monsoon and moderately cold winter. Fresh, mature cut inflorescences of *Heliconia rostrata*, *Heliconia psittacorum* cv. 'Golden Torch', *Heliconia psittacorum* var. 'Choconiana', *Heliconia humilis* were selected and described hereunder. Commonly inflorescences were harvested early morning period from the garden of the Agri-Horticultural Society of India in the month of April which continued up to June, 2016. After harvesting flowers with stem was placed inside the bucket and fill-up normal water and brought to the laboratory within one hour. Healthy stems with flowers were taken from bunch of *Heliconia* for experiment. Stems free of visual defects were used in this experiment. Prior to imposition of treatments, the stems were re-cut under water so as to remove the basal 30cm in order to avoid stem-end air emboli. Inflorescences of more or less uniform in size were cut uniformly with varying size depending upon different species/varieties/forms and their individual weight was taken. The experiments were applied in completely randomized design (CRD) having 3 replications and 10 treatments. The data were subjected to analysis of variance (ANOVA) using SPSS 10.0 statistical package. The treatment means were compared by Duncan's New Multiple Range Test (DNMRT) at 5% probability level. Ten treatment combinations are mentioned here: T_1= Control (distilled water), T_2= Standard preservative (Howland, 1984) (2 teaspoonful of fresh lemon juice, 1 teaspoonful of common sugar, ½ teaspoonful of household bleach in 1 liter of water), T_3= 8-hydroxyquinoline citrate (8- HQC)[source and grades- MERCK, 8-hydroxyquinoline, GR, ACS] @ 500mg/l, T_4=8-hydroxyquinoline citrate (8- HQC) @500mg/l+ Sucrose[source and grades- MERCK, Sucrose pure] 2%, T_5= Silver nitrate ($AgNO_3$)[source and grades- Silver nitrate for analysis EMPARTAR ACS]@1500ppm+ 8-hydroxyquinoline citrate(8-HQC)@500mg/l+ Sucrose 2%, T_6= Calcium chloride ($Cacl_2$)[source and grades- MERCK, Calcium chloride fused] @ 750mg/l+ 8-hydroxyquinoline citrate (8- HQC)@500mg/l+ Sucrose 2%, T_7= Gibberellic acid (GA_3) [Source and grades- CDH, Gibberellic acid-C_{19} H_{22} O_{16}] @ 80µM+ 8-hydroxyquinoline citrate (8- HQC)@500mg/l+ Sucrose 2%, T_8= 1-Naphthalene Acetic Acid (NAA)[source and grades- SRL, 1-Naphthalene Acetic acid extra pure] @ 100ppm+ 8-hydroxyquinoline citrate(8- HQC)@500mg/l+ Sucrose 2%, T_9= Citric acid [source and grades- Citric Acid-1-hydrate cryst. extra pure]@ 200mg/l+8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%, T_{10}= 6-Benzylaminopurine (BAP)[source and grades- MERCK, 6-Benzylaminopurine]@ 50µM+ 8-hydroxyquinoline citrate(8- HQC)@500mg/l+ Sucrose 2%

RESULTS AND DISCUSSION

Data recorded of the present experiment divulged that treatments comprising of germicides, biocides, plant growth regulators and organic acids additionally with sucrose as vase solution ameliorated water uptake rate, fresh flowers weight retention and floret opening (%) on *Heliconia* inflorescence as compared to control (Table 1). In 'Golden Torch' fairly good amount of solution uptake of 90ml was noted by T_4 treatment combination respectively while 89.67ml in *Heliconia rostrata* and 84.33ml in *Heliconia humilis* by T_3 treatment. In *Heliconia humilis* T_2,T_3 and T_{10} showed maximum water uptake of about 84 ml. In *Heliconia psittacorum* var. 'Choconiana', T_7 (52.66ml) was the maximum water uptake (Table 2).

Rest of the treatment combinations failed to prove them unsurpassable. Apparently in all *Heliconia* inflorescences fresh weight retention percentages are generally used here. It is pronounced from the T_4 (8-hydroxyquinoline-citrate @500mg/l+ Sucrose 2%) and T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate@500mg/l+ Sucrose 2%) treatment combinations optimum upshot in case of *Heliconia psittacorum* cv. 'Golden Torch' on 4th day and significant increase on 8th and 12th day were also perceived. T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combination established itself as the best subject to this parameter for *Heliconia rostrata* whileT_2(Standard preservative (Howland, 1984) (2 teaspoonful of fresh lemon juice, 1 teaspoonful of common sugar, ½ teaspoonful of household bleach in 1 liter of water) and T_3(8-hydroxyquinoline citrate @ 500mg/l) treatment combinations both exhibited adequate fresh weight increase in *Heliconia humilis*. It is transparent from that fresh weight simple increase was received on 8th day with aid of control. It is perceptible from that concerning *Heliconia psittacorum* var. 'Choconiana' utilized all treatment combinations were not significantly different from others in respect

Table 1: Effect of different treatments on *Heliconia rostrata*

Treatments	Total water uptake rate (ml)	Change in fresh weight (%)			Flower opening in bract (%)	Catalase (CAT) (mm/min) g FW			Vase-Life (Days)
		4thDays	8thDays	12thDays		7thDays	9thDays	11thDays	
T_1	59.67±0.57^{c}	1.66±0.66^{b}	2.66±0.66^{c}	4.33±0.88^{b}	10.00±0.57^{e}	0.24±0.00^{h}	0.04±0.00^{g}	0.00±0.00^{f}	10.00±0.57^{e}
T_2	70.33±0.88^{b}	3.00±0.57^{ab}	4.00±0.57^{bc}	5.00±0.57^{b}	11.33±0.66^{d}	0.30±0.01^{f}	0.13±0.00^{f}	0.09±0.00^{e}	11.33±0.66^{d}
T_3	89.67±0.88^{a}	4.00±0.57^{ab}	5.00±0.57^{abc}	5.33±0.88^{ab}	12.66±0.33^{c}	0.22±0.00^{i}	0.16±0.00^{e}	0.10±0.00^{e}	12.66±0.33^{c}
T_4	60.33±0.57^{c}	2.00±0.57^{b}	3.33±0.66^{bc}	4.33±0.66^{b}	12.33±0.88^{c}	0.35±0.00^{e}	0.24±0.00^{d}	0.16±0.00^{d}	12.33±0.88^{c}
T_5	49.00±0.88^{d}	2.33±0.88^{b}	4.00±1.00^{bc}	5.33±1.20^{ab}	14.00±1.00^{b}	0.61±0.00^{bc}	0.44±0.00^{b}	0.31±0.00^{b}	14.00±1.00^{b}
T_6	75.00±0.57^{b}	2.66±0.88^{ab}	3.66±0.88^{bc}	4.66±0.88^{b}	15.33±0.66^{a}	0.65±0.00^{a}	0.45±0.00^{b}	0.36±0.00^{a}	15.33±0.66^{a}
T_7	55.00±0.57^{c}	5.00±0.57^{a}	6.66±0.88^{a}	8.00±0.57^{a}	16.00±0.57^{a}	0.60±0.00^{c}	0.40±0.00^{c}	0.29±0.00^{c}	16.00±0.57^{a}
T_8	45.33±0.88^{e}	3.66±0.88^{ab}	5.33±0.66^{ab}	6.66±0.88^{ab}	11.00±0.57^{d}	0.61±0.00^{b}	0.44±0.00^{b}	0.31±0.00^{b}	11.00±0.57^{d}
T_9	70.00±0.57^{b}	2.33±0.88^{b}	4.00±1.00^{bc}	5.33±1.20^{ab}	14.33±0.66^{b}	0.27±0.00^{g}	0.23±0.00^{d}	0.15±0.00^{d}	14.33±0.66^{b}
T_{10}	50.00±0.88^{d}	2.00±0.57^{b}	4.00±0.57^{bc}	5.00±0.57^{b}	11.66±0.88^{d}	0.44±0.01^{d}	0.48±0.00^{a}	0.37±0.00^{a}	11.66±0.88^{d}

Table 2: Effect of different treatments on *Heliconia psittacorum spathocircinata cv.* 'Golden Torch'

Treatments	Total water uptake (ml)	Change in fresh weight (%)			Flower opening in bract (%)	Catalase (CAT) (mm/min) g FW			Vase-Life (Days)
		4thDays	8thDays	12thDays		7thDays	9thDays	11thDays	
T_1	35.00±0.57^{e}	1.66±0.66^{c}	3.00±0.57^{b}	4.00±0.57^{b}	0.00±0.00^{h}	0.26±0.01^{f}	0.13±0.03^{e}	0.00±0.00^{f}	11.66±0.33^{c}
T_2	40.33±0.88^{d}	4.00±0.57^{ab}	5.66±0.88^{ab}	7.00±1.00^{ab}	15.00±0.57^{g}	0.33±0.01^{e}	0.16±0.01^{e}	0.00±0.00^{f}	10.33±0.88^{d}
T_3	27.33±0.88^{f}	2.00±0.57^{bc}	3.66±0.88^{ab}	5.00±1.15^{ab}	17.00±0.57^{f}	0.24±0.01^{f}	0.17±0.01^{e}	0.10±0.00^{e}	12.33±0.33^{bc}
T_4	90.00±0.57^{a}	5.00±0.57^{a}	6.33±0.66^{a}	7.33±0.66^{a}	19.00±0.57^{e}	0.37±0.01^{d}	0.27±0.01^{d}	0.19±0.01^{d}	13.66±1.15^{b}
T_5	65.33±0.88^{b}	4.66±0.88^{a}	5.66±0.88^{ab}	7.33±1.20^{a}	28.00±0.57^{c}	0.62±0.02^{b}	0.46±0.01^{ab}	0.33±0.01^{b}	15.33±0.88^{a}
T_6	50.00±0.57^{c}	3.66±0.88^{abc}	5.33±1.20^{ab}	6.66±0.88^{ab}	36.00±0.57^{a}	0.68±0.01^{a}	0.48±0.01^{a}	0.37±0.01^{a}	13.33±1.20^{b}
T_7	25.00±0.57^{g}	2.33±0.88^{bc}	5.33±1.20^{ab}	6.33±1.20^{ab}	23.33±0.66^{d}	0.62±0.01^{b}	0.42±0.01^{bc}	0.31±0.01^{b}	15.00±0.57^{a}
T_8	20.33±0.88^{h}	2.00±0.57^{bc}	3.33±0.66^{b}	4.66±0.88^{ab}	31.66±0.88^{b}	0.63±0.02^{b}	0.46±0.02^{ab}	0.32±0.01^{b}	11.33±0.88^{c}
T_9	35.00±0.57^{e}	2.00±0.57^{bc}	3.00±0.57^{b}	4.00±0.57^{b}	16.00±0.57^{fg}	0.31±0.02^{e}	0.25±0.02^{d}	0.17±0.01^{d}	13.66±0.88^{b}
T_{10}	28.33±0.88^{f}	2.00±0.57^{bc}	3.33±0.33^{b}	5.00±0.57^{ab}	33.00±0.57^{b}	0.57±0.01^{c}	0.40±0.02^{c}	0.22±0.01^{c}	11.00±0.57^{c}

Table 3: Effect of different treatments on *Heliconia psittacorum* var. 'Choconiana'

Treatments	Total water uptake (ml)	Change in fresh weight (%)			Flower opening in bract (%)	Catalase (CAT) (mm/min) g FW			Vase-Life (Days)
		4thDays	8thDays	12thDays		7thDays	9thDays	11thDays	
T_1	49.33±0.88^{ab}	2.00±0.57^{a}	3.33±0.66^{a}	4.66±0.88^{a}	0.00±0.00^{e}	0.01±0.24^{f}	0.33±0.08^{bc}	0.00±0.00^{h}	10.66±0.88^{f}
T_2	51.33±0.88^{a}	2.66±0.33^{a}	4.66±1.76^{a}	6.33±1.45^{a}	14.66±0.33^{d}	0.33±0.03^{e}	0.14±0.03^{d}	0.15±0.05^{g}	11.00±0.57^{e}
T_3	35.33±0.88^{cd}	1.66±0.66^{a}	4.00±0.57^{a}	5.33±0.88^{a}	19.33±0.33^{c}	0.26±0.05^{f}	0.16±0.06^{d}	0.18±0.05^{f}	11.33±0.66^{e}
T_4	30.33±1.20^{d}	1.66±0.33^{a}	4.33±1.20^{a}	6.00±1.52^{a}	18.00±1.15^{c}	0.38±0.01^{d}	0.27±0.05^{c}	0.33±0.05^{c}	12.33±0.66^{d}
T_5	50.00±0.57^{ab}	2.00±0.57^{a}	2.33±0.33^{a}	3.33±0.33^{a}	22.00±0.57^{b}	0.67±0.01^{a}	0.48±0.03^{a}	0.47±0.05^{a}	16.00±0.57^{a}
T_6	38.00±0.50^{cd}	1.66±0.66^{a}	3.33±0.33^{a}	4.66±0.66^{a}	17.66±0.88^{c}	0.66±0.02^{a}	0.47±0.03^{a}	0.37±0.05^{b}	15.33±0.88^{a}
T_7	52.66±0.88^{a}	2.00±0.57^{a}	3.00±0.57^{a}	4.00±0.57^{a}	24.66±0.33^{a}	0.68±0.03^{a}	0.43±0.03^{ab}	0.31±0.05^{d}	15.33±0.33^{a}
T_8	41.33±0.88b^{c}	2.33±0.88^{a}	4.33±1.20^{a}	6.33±1.20^{a}	15.00±0.57^{d}	0.60±0.03^{b}	0.46±0.01^{a}	0.32±0.05^{cd}	13.00±0.00^{bc}
T_9	37.33±0.88^{cd}	2.00±0.57^{a}	4.66±1.45^{a}	6.33±1.45^{a}	19.33±0.33^{c}	0.48±0.01^{c}	0.26±0.01^{c}	0.17±0.05^{f}	14.66±0.88^{b}
T_{10}	32.67±0.88^{cd}	2.66±1.20^{a}	4.66±0.88^{a}	6.33±1.20^{a}	23.33±0.88^{ab}	0.40±0.02^{d}	0.51±0.01^{a}	0.29±0.05^{e}	12.00±0.57^{d}

Table 4: Effect of different treatments on *Heliconia humilis*

Treatments	Total water uptake (ml)	Change in fresh weight (%)			Flower opening in bract (%)	Catalase (CAT) (mm/min) g FW			Vase-Life (Days)
		4thDays	8thDays	12thDays		7thDays	9thDays	11thDays	
T_1	69.66±0.88^{c}	1.66±0.66^{c}	2.66±0.66^{c}	4.00±0.57^{d}	0.00±0.00^{h}	0.58±0.23^{a}	0.51±0.15^{a}	0.00±0.00^{b}	11.66±0.33^{d}
T_2	84.33±0.88^{a}	6.00±0.57^{a}	7.33±0.66^{a}	8.66±0.88^{ab}	25.00±0.57^{d}	0.66±0.19^{a}	0.60±0.10^{a}	0.52±0.09^{a}	11.33±0.88^{d}
T_3	84.33±1.20^{a}	6.00±0.57^{a}	7.66±0.88^{a}	9.33±1.20^{a}	31.00±0.57^{b}	0.79±0.08^{a}	0.71±0.18^{a}	0.46±0.04^{a}	12.33±0.33^{c}
T_4	69.00±1.15^{c}	3.00±0.57^{bc}	4.66±0.88^{bc}	6.66±0.88^{abcd}	22.00±0.57^{e}	0.74±0.21^{a}	0.67±0.07^{a}	0.63±0.18^{a}	13.66±1.15^{b}
T_5	80.33±0.88^{b}	2.33±0.88^{bc}	3.66±0.88^{bc}	4.66±0.88^{d}	32.66±0.88^{b}	0.70±0.25^{a}	0.54±0.02^{a}	0.59±0.20^{a}	15.33±0.88^{a}
T_6	70.33±0.88^{c}	3.00±0.57^{bc}	4.66±0.88^{bc}	6.33±0.88^{bcd}	29.00±1.15^{c}	0.82±0.14^{a}	0.60±0.05^{a}	0.49±0.05^{a}	15.33±1.20^{a}
T_7	55.00±1.15^{e}	2.00±0.57^{bc}	3.66±0.33^{bc}	5.33±0.88^{cd}	15.00±0.57^{g}	0.62±0.06^{a}	0.50±0.08^{a}	0.41±0.23^{a}	14.00±0.57^{ab}
T_8	65.33±0.88^{d}	4.00±0.57^{b}	6.00±1.00^{ab}	7.66±0.88^{abc}	20.00±0.57^{f}	0.74±0.15^{a}	0.51±0.07^{a}	0.36±0.02^{ab}	12.33±0.88^{c}
T_9	45.00±0.57^{f}	3.00±0.57^{bc}	4.33±0.66^{bc}	5.66±0.88^{cd}	35.00±0.57^{a}	0.69±0.15^{a}	0.66±0.17^{a}	0.59±0.21^{a}	14.66±0.88^{ab}
T_{10}	84.66±0.88^{a}	2.00±0.57^{bc}	3.33±0.33^{c}	4.33±0.33^{d}	28.00±0.57^{c}	0.70±0.18^{a}	0.67±0.08^{a}	0.51±0.06^{a}	12.00±0.57^{c}

Vase life of Rostrata (1St, 7Th,11Th)

Vase life of Golden Torch (1st, 7th,11th)

Vase life of Choconiana (1st, 7th,11th)

Vase life of Humilis (1st, 7th, 11th)

Fig.1: Vase life of different sps of *Heliconia* at three different days (1st, 7th and 11th)

of number of days also i.e. entire treatment sets had equal impact on this parameter. Experimental findings exhibited that T_6 (Calcium chloride @ 750mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combination was unrivalled for *Heliconia psittacorum spathocircinata* cv. 'Golden Torch' (36%), in respect of flower opening per cent in bracts followed byT_{10} (6-Benzylaminopurine @ 50µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) andT_8(1-Naphthalene Acetic Acid @ 100ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%)respectably. It is documented that T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_9 (Citric acid @ 200mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combinations revealed optimal result in case of *Heliconia rostrata*, *Heliconia psittacorum* var. 'Choconiana' and *Heliconia humilis*.T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_3(8-hydroxyquinoline citrate @ 500mg/l) entrenched themselves as next best treatment combinations for *Heliconia rostrata* and *Heliconia humilis.* Treated inflorescences of *Heliconia psittacorum spathocircinata* cv. 'Golden Torch', *Heliconia rostrata*, exhibited higher catalase activity (CAT) by T_6 (Calcium chloride @ 750mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combination. But unanticipetedly passable catalase activity of 0.65 mM/ min/ g Fresh weight was registered in untreated cut spikes of *Heliconia psittacorum* var. 'Choconiana' only (Table 3). Parallely, T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%),T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_6 (Calcium chloride @ 750mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) also manifested noteworthy catalase (CAT) activity in the same species. In this experiment all treatment sets become unsuccessful to show consequential differences among themselves in *Heliconia humilis* concerning catalase activity for all three durational treatments (Table 4). Outstanding catalase activity due to the effectof T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%), T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_8 (1-Naphthalene Acetic Acid @ 100ppm+ 8-hydroxyquinoline citrate @500mg/l + Sucrose 2%) treatment combinations of *Heliconia psittacorum* cv. 'Golden Torch' were a notable picture, the protracted vase life of treated *Heliconia* inflorescences were documented in this investigation juxtaposes to untreated cut spikes. The uttermost longevity was observed mostly by T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%), T_6 (Calcium chloride @ 750mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%), T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_9 (Citric acid @ 200mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combinations in case of entire cut inflorescences utilized. It is discernible from the experimental detections that *Heliconia humilis* and *Heliconia psittacorum* cv. 'Choconiana', showcased remarkable extension subject to their vase-life with assist of the above disclosed treatment combinations. These treatment combinations increased the vase life of cut mixed cyme inflorescences about 4 to 5 days more than that of controlled cut inflorescences where the longevity of 11 days in average were found. In case of both *Heliconia psittacorum spathocircinata* cv. 'Golden Torch' and *Heliconia rostrata,*T_7 (Gibberellic acid @ 80µM+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) manifested itself as leading treatment combination being showcased 15 and 16 days of vase life respectively followed byT_9 (Citric acid @ 200mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%), T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%), T_6 (Calcium chloride @ 750mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) and T_9 (Citric acid @ 200mg/l+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) treatment combinations proved themselves as second best. Here DIW (deionized water) and SP (standard preservative) failed to prove as competent holding solution for these cut spikes. Extended vase life of cut flowers are influenced by supplementation of chemical preservatives customarily sugars and germicides in the holding solution where sugars pledged respiratory substrate and germicides intercepted bacterial growth as well as the corking of conducting tissues (Nair *et al.,* 2003). The effect of combination treatment ultimately facilitated the solution uptake by different *Heliconia* inflorescences eventually made them fresh. In most of the species and varieties utilized here the combination of T_5 (Silver nitrate @1500ppm+ 8-hydroxyquinoline citrate @500mg/l+ Sucrose 2%) increased the solution uptake significantly. Meman and Dabhi (2006) concluded that the antimicrobial property of 8-HQC (8-hydroxyquinoline citrate) assisted in resistance free solution flew in cut inflorescences of gladiolus which was consistent with the result in *Heliconia*. Silver ions in the form of silver nitrate aid in increase the postharvest life of cut flowers (Subhashini *et al,*. 2011) while sucrose bestows in maintaining water balance in flowers by influencing osmotic pressure of petal cells (Halevy and Mayank, 1981). Cut flowers without leaves, the major source of food survive under reduced illumination while

used in indoors finally limit the carbohydrate availability and onset of senescence was noticed then. Fresh weight retention is determined by the maintenance of carbohydrate and water level.At the end we may conclude that fusion of biocides like $AgNO_3$, $CaCl_2$ plant growth regulators like GA_3 and organic acid like citric acid along with a germicide (8-HQC) and sucrose evidently influence the post-harvest durability and enhance the vase-life of all *Heliconia* inflorescences utilized here.

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